STORAGE BATTERY CHARGING STATION

BACKGROUND OF THE INVENTION

The invention relates to a charging station for a rechargeable battery that is structurally and electrically compatible with the battery, such as a storage battery module for cordless hand tool machines. In modern rechargeable batteries, high energy densities can be charged in a brief period using a charging station, whereby the battery heats up significantly. An important field of application of such high-density energy rechargeable batteries are storage battery modules for cordless hand tool machines such as screwing drills, combination hammers, hand circular saws, etc. In addition, the charger electronics of the charging station also heat up significantly due to the transformation of the high output.

EP 1178557 discloses a charging station for a rechargeable storage battery module for cordless hand tool machines that can be electrically and structurally connected to it. The charging station has charging electronics, in a charger housing, with an electrical and structural contact interface for the storage battery module. A blower is arranged in the charger housing. Optimally, a cooling/heating system is arranged downstream of the airflow outlet, between two air vents. An air vent on the airflow outlet side is associated with the structural contact interface of the storage battery module. There is no active cooling of the charger electronics arranged external to the air flow in the housing corners or in separate housing sections. The air can, however, be pre-warmed by waste heat from the charger housing, which restricts the airflow before it cools the storage battery module. The warmed air from the storage battery module is discharged unused into the environment.

SUMMARY OF THE INVENTION

The object of the invention is to provide a process and a configuration for efficient cooling of the battery and the charging electronics.

This object is essentially achieved, in accordance with the invention, by a charging station for a rechargeable battery that can be connected structurally and electronically with the battery. The charging station has a charger electronics in a charger housing with an electrical and physical contact interface for the battery, wherein an air blower for producing an airflow through two air vents is arranged in the charger housing, wherein an air vent is spatially associated with the physical contact interface of the battery and wherein the charger electronics are arranged for heat transfer in the air current.

The arrangement of both the battery and the charger electronics in series, in a common heat-transferring air current, cools efficiently, because, along with a constant cooling surface and the temperature difference, the flow rate is also involved in the heat transmission.

It is also advantageous that the air vent spatially associated with the physical contact interface of the battery is arranged at the flow inlet side. By the association of the flow inlet side air vent with the battery, the air warmed by the battery initially arrives in the charger housing with the air blower, where it then cools the charger electronics and is then discharged to the environment.

The air blower is advantageously arranged between the air vent on the flow inlet side and the charger electronics, whereby the charger electronics arranged in the high-pressure path

does not contribute to the pressure drop in the low-pressure path, in which the battery is situated. As a result, a strong flow is achieved.

The air vent on the flow inlet side advantageously forms multiple, surface distributed air inlet points, which are spatially associated with cooling vents of the battery, whereby the cooling air mass can be distributed to individual cells within the battery.

Advantageously, a pressure chamber with a low flow resistance is provided between the air blower and the air inlet points. This permits uniform distribution of the air volume between separate cells of the battery.

The air vent on the flow inlet side is advantageously arranged in the upper part of the charging station, wherein with expedient set-up of the charging station, less dust is picked up in the air current, which is particularly advantageous in polluted work sites.

Essentially, the cooling process of a charging station for a rechargeable battery that can be physically and electrically connected to the battery moves a volume of air of an air current produced by an air blower arranged in the charger housing of the charging station. In an initial process step, the air volume with a cooling temperature KT is moved past or into the battery while transferring heat. In a second process step, the air volume with an intermediate temperature IT > CT permeates the charger housing having charging electronics.

For one and the same air volume in the air current, different cooling heat transfers form due to the temporal sequence of the heat-transferring arrangement of the battery and the charging electronics. The heat transfers depend on the temperature difference. Since the permissible

surface temperature of the charger electronics essentially lies above the temperature of the battery, an air volume taken from the environment and having a cooling temperature CT [KT], initially, optimally cools the battery and then at the intermediate temperature IT [ZT] adequately cools the charging electronics before it is again discharged to the environment at the waste heat temperature WT [AT]. Thus, the overall available streaming air volumes are taken advantage of for efficient cooling.

BRIEF DESCRIPTION OF THE INVENTION

The preferred embodiment of the invention is described below with reference to the drawing, wherein Fig. 1 shows a charging station with storage battery pack according to the invention.

DETAILED DESCRIPTION OF THE INVENTION

Fig. 1 shows a charging station 1 having a charging electronics 2 in a charger housing 3 that is physically and electrically connected to a rechargeable battery 5, in the form of a storage battery module having a plurality of cells 11, by an electrical and physical contact interface 4. An air blower 6 is arranged in the charger housing 3. The blower 6 produces an air current L through two air vents 7a, 7b. The charger electronics 2 are heat-transfer arranged in the air current.

The air vent 7a, on the flow inlet side, is spatially associated with the physical contact interface 4 of the battery. The air blower 6 is arranged between the air vent 7a, on the flow inlet side, and the charging electronics 2. The air vent 7a on the flow inlet side has a plurality of

surface-distributed air inlet points 8. Each surface-distributed air inlet point 8 is spatially associated with cooling vents 9 in the module housing 12 of the battery. A pressure chamber 10 having low flow resistance is arranged between the air blower 6 and the air inlet points 8.

The cooling process moves a hypothetical air volume V along an air current L produced by the air blower 6. The air volume V at a cooling temperature CT [KT] relative to the environment U moves past the battery 5 in a heat-transfer fashion and then permeates charger housing 3 containing a charger electronics heat-transfer arranged in an air current L at an intermediate temperature IT > KT, before it is released into the environment U at a waste heat temperature WT [AT].